4.9 NOISE

This section discusses the potential noise impacts of the construction and operation of the proposed Tucson Electric Power Company (TEP) Sahuarita-Nogales Transmission Line Project along each alternative corridor. The methodology for determining impacts is presented below, followed by a description of the impacts from each alternative.

Methodology

The noise impact analysis evaluates the potential noise levels generated during construction and operation of the proposed project, and identifies potential receptors along each alternative corridor. The analysis includes quantification of projected noise levels and assesses the potential for corona effects from transmission lines. Specific noise impacts would be mitigated by limiting the daily hours of construction of the proposed project.

As explained in Section 3.9, noise levels are measured as a composite decibel (dB) value. The adjusted decibels (dBA) represent the human hearing response to sound for a single sound event. Day-Night Average Sound Level (DNL) represents the average sound level over a complete 24-hour period, which is often used for the evaluation of community noise effects.

For construction of the proposed project, both an average noise level (DNL) and a single sound event noise level (dBA) have been evaluated. The single sound event analysis shows the peak noise levels near the right-of-way (ROW), while the DNL predicts average community noise levels near the ROW. For this analysis, the calculation of the DNL assumes that no construction would occur between the hours of 10 p.m. and 7 a.m. The noise levels are calculated for the nearest residences and businesses to the ROW. Noise levels would be reduced for receptors further removed from the ROW by approximately 6 dBA for each doubling of distance from the source. For example, a 75 dBA noise heard at 50 ft (15 m) from the source would be reduced to 69 dBA at 100 ft (30 m) away from the source (Canter 1977).

The potential for construction noise to impact wildlife is addressed in the Biological Assessments prepared for the proposed project, included as Appendices D, E, and F of this Environmental Impact Statement (EIS) (HEG 2003a, 2003b, 2003c). The species that may be affected are described in this section and in Section 4.3, Biological Resources.

In determining the significance of the calculated DNL, results for each alternative are compared to established standards. In 1974, the U.S. Environmental Protection Agency (EPA) identified noise levels that could be used to protect public health and welfare, including prevention of hearing damage, sleep disturbance, and communication disruption. Outdoor DNL values of 55 dBA were identified as desirable to protect against activity interference and hearing loss in residential areas and at educational facilities.

The determination as to whether the impact of a single sound event (or series of single events) is significant is a qualitative assessment of the increase in noise level above background as experienced by receptors near the source. A subjective response to changes in sound levels based upon personal judgements of sound presented within a short timespan indicate that a change of ±5 dBA may be quite noticeable, although changes that take place over a long period of time of this magnitude or greater may be "barely perceptible." Changes in sound levels of ±10 dBA within a short timespan may be perceived by humans as "dramatic" and changes in sound levels of ±20 dBA within a short timespan may be perceived as "striking." In qualitative terms, these types of changes in sound level could be considered significant (DOE 2001a).

The construction schedule of each alternative would likely involve several areas under active construction concurrently. As construction of the project progresses, the areas impacted by noise would follow the active construction areas. Construction for the proposed project would be completed in a period of 12 to 18 months.

4.9.1 Western Corridor

Construction Impacts. The acoustical environment would be impacted during construction of the Western Corridor. Construction activities would generate noise produced by heavy construction equipment and trucks used along the access roads and ROW. Explosives blasting may be used as needed, based on local geologic conditions, and thus could contribute to noise impacts. Construction noise levels would be variable and intermittent, as equipment is operated on an as-needed basis. Construction activities normally would be limited to daytime hours, and thus would not impact existing background noise levels at night. While relatively high peak noise levels in the range of 80 to 103 dBA would occur on the active construction sites, these noise levels would be temporary and intermittent. Table 4.9–1 presents the peak noise levels (dBA) expected for a single sound event from various equipment during construction.

Table 4.9–1. Peak Attenuated Noise Levels (dBA) Expected from Construction Equipment[a].

Source	Peak Noise Level	Distance from Source						
		50 ft	100 ft	200 ft	400 ft	1,000 ft	1,700 ft	2,500 ft
Heavy Trucks	95	84-89	78-83	72-77	66-71	58-63	54-59	50-55
Dump trucks	108	88	82	76	70	62	58	54
Concrete mixer	108	85	79	73	67	59	55	51
Jackhammer	108	88	82	76	70	62	58	54
Scraper	93	80-89	74-82	68-77	60-71	54-63	50-59	46-55
Bulldozer	107	87-102	81-96	75-90	69-84	61-76	57-72	53-68
Generator	96	76	70	64	58	50	46	42
Crane	104	75-88	69-82	63-76	55-70	49-62	45-48	41-54
Loader	104	73-86	67-80	61-74	55-68	47-60	43-56	39-52
Grader	108	88-91	82-85	76-79	70-73	62-65	58-61	54-57
Pile driver	105	95	89	83	77	69	65	61
Forklift	100	95	89	83	77	69	65	61

[a] Attenuation with distance is dependent on the frequency of the sound and thus varies as shown for the following sources of varying frequencies.
Source: Golden et al. 1980.

The combined effect of several equipment types operating simultaneously is not represented by the sum of the individual noise levels, but rather is calculated based on the logarithmic scale of decibels (see explanation in Section 3.9). Table 4.9–2 presents the results of a sample calculation assuming a scenario of a bulldozer, jackhammer, and scraper operating simultaneously, which is highly unlikely.

Table 4.9–2. Example of Maximum Combined Peak Noise Level from Bulldozer, Jackhammer, and Scraper.

	Distance from Source				
	50 ft	**100 ft**	**200 ft**	**1,000 ft**	**2,500 ft**
Combined Peak Noise Level	103 dBA	97 dBA	91 dBA	77 dBA	69 dBA

For tower sites where workers or equipment are to be inserted by helicopter or sky crane, the approach, landing, and takeoff of a helicopter would be an additional noise source. Noise from medium-lift helicopters typical of those that would be used is in the range of 90 to 100 dBA at 100 ft (31 m). Helicopters are most likely to be used within the Coronado National Forest, where fewer access roads currently exist.

Explosives blasting may be required at tower locations founded on bedrock in steep terrain, in order to level the base prior to rock bolting the tower. The projected peak noise levels associated with explosives blasting would be in the range of the construction equipment listed in Table 4.9–1 (Golden et al. 1980). As blasting is accomplished most efficiently by directing the blasting energy into the ground, the noise associated with blasting would be mitigated by the noise absorbing effects of the ground.

The potential construction noise impacts of the Western Corridor would primarily affect the residences and commercial areas in the immediate vicinity of the ROW, as described in Land Use, Section 3.1. The existing background noise in residential and commercial areas is typically 45 dBA or higher. Table 4.9–2 shows that peak construction noise at a distance of approximately 1,000 ft (305 m) from the ROW would be an estimated 77 dBA. The residences nearest to the ROW (an estimated 1,000 ft [305 m] away), as described in Section 3.1, would experience construction noise levels that may be perceived as striking or very loud, comparable to a lawn mower or a leaf blower. These peak noise levels would be localized and intermittent. The average total duration that any construction area may be active is 2 to 3 months. In addition to residences and businesses, intermittent peak noise levels would be experienced by nearby hikers and participants in other recreation within the Coronado National Forest, as described in Section 3.1.2.

Impacts to jaguars may result from noise disturbance associated with construction activities, especially during morning or late evening hours. However, these impacts would be widely distributed because of the linear nature of the project (HEG 2003a).

Impacts to cactus ferruginous pygmy-owls may result from noise disturbance associated with construction activities. According to the Harris Environmental Group (2003a), “short term noise disturbance and human activity associated with construction activity may temporarily discourage cactus ferruginous pygmy-owl use of habitat within and immediately adjacent to the proposed right-of-way.”

A second measure of construction noise is the 24-hour average noise level, represented by the DNL to gauge average community noise effects. The DNL would decrease to near the background noise level of 48 dBA for receptors beyond 325 ft (99 m) from the ROW.

In evaluating the potential for hearing damage (both Temporary Threshold Shift and Noise-Induced Permanent Threshold Shift), the noise level and duration of exposure are considered. For example, Noise-induced Permanent Threshold Shift would be produced by unprotected exposures of 8 hours per day for several years to noise above 105 dBA. Similarly, Temporary Threshold Shift would be based on exposure to a steady noise level of 80 to 130 dBA, increasing with duration of exposure (Canter 1977). The intermittent peak construction noise levels would not create the steady noise level conditions for an

extended duration that could lead to Temporary Threshold Shift or Noise-induced Permanent Threshold Shift hearing damage.

Operational Impacts. Upon completion of construction, the potential for noise impacts associated with the project would be from three major sources: (1) corona from the transmission lines (a crackling or hissing noise); (2) operation of the transformers at the substations; and (3) maintenance work and vehicles.

Corona is the electrical breakdown of air into charged particles caused by the electrical field at the surface of conductors. Corona-generated audible noise from transmission lines is generally characterized as a crackling or hissing noise. During dry weather conditions, audible noise from transmission lines is often lost in the background noise at locations beyond the edge of the ROW. Modern transmission lines are designed, constructed, and maintained so that during dry conditions they will operate below the corona-inception voltage, meaning that the line will generate a minimum of corona-related noise. Sound level measurements taken during fair weather at existing TEP 345-kV transmission lines indicate only a 2 to 3 dB difference between background noise levels and levels beneath the transmission lines (Meyer 2001b). In foul weather conditions corona discharges can be produced by water droplets and fog. Given the arid climate in the project area and the distance of receptors from the ROW, the impact of corona-generated audible noise is not expected to be significant.

Transformers at the existing South Substation in Sahuarita and the new Gateway Substation in Nogales would generate minimal noise during operation. There are no residences within 0.5 mi (0.8 km) of either substation and the substation noise would not be discernible from background noise at any residences. Measurements at an existing TEP substation similar to those proposed indicate sound levels to be typically 40 to 55 dBA, within the existing background range (Meyer 2001b). Occasional maintenance activities on the transmission lines and substations would be required. Noise impacts from these activities would be intermittent and are not expected to be significant.

Based upon the noise impacts analyses of the Western Corridor, the primary effect of noise generated would probably be one of annoyance to the residents nearest to the ROW during the construction period. Construction workers would be located closer to the noise sources, would experience longer exposure durations than the public, and would follow standard industry and Federal Occupational Safety and Health Administration (OSHA) procedures for hearing protection.

4.9.2 Central Corridor

Construction Impacts. The acoustical environment would be impacted during construction of the Central Corridor similarly to the Western Corridor as described in Section 4.9.1. While relatively high peak noise levels in the range of 80 to 103 dBA would occur on the active construction sites, these noise levels would be temporary and intermittent. As there is increased development along the I-19 corridor compared to the Western Corridor, as described in Section 3.1, Land Use, a few more residences may experience temporary construction noise impacts.

Table 4.9–1 presents the peak noise levels (dBA) expected for a single sound event from various equipment during construction. Table 4.9–2 presents the results of a sample calculation assuming a scenario of a bulldozer, jackhammer, and scraper operating simultaneously, which is highly unlikely.

The potential construction noise impacts of the Central Corridor would primarily affect the residences and commercial areas in the immediate vicinity of the ROW. The residences nearest to the ROW (at a distance of approximately 500 ft [150 m]), as described in Section 3.1, would experience construction noise levels that may be perceived as “striking” or very loud. Peak noise levels experienced by Tubac

residents would be comparable to a street sweeper at a distance of 30 ft (9 m). These peak noise levels would be localized, temporary, and intermittent. In addition to residences and businesses, intermittent peak noise levels would be experienced by nearby hikers and participants in other recreation along the limited segment of the Central Corridor in the Coronado National Forest, as described in Section 3.1.2.

A second measure of construction noise is the 24-hour average noise level, represented by the DNL to gauge average community noise effects. The DNL would decrease to near the background noise level of 48 dBA for receptors beyond 325 ft (99 m) from the ROW. As described for the Western Corridor the intermittent peak construction noise levels would not create the steady noise level conditions for an extended duration that could lead to Temporary Threshold Shift or Noise-induced Permanent Threshold Shift hearing damage (Canter 1977).

Operational Impacts. Upon completion of construction, the potential for noise impacts associated with the project would be from three major sources: (1) corona from the transmission lines (a crackling or hissing noise); (2) operation of the transformers at the substations; and (3) maintenance work and vehicles. As with the Western Corridor in Section 4.9.1, the potential corona effects and substation operational noise would be comparable to background noise levels for receptors, and thus not significant. Noise impacts from maintenance activities would be intermittent and not expected to be significant.

Based upon the noise impacts analyses of the Central Corridor, the primary effect of noise generated would probably be one of annoyance to the residents nearest to the ROW during the construction period. Construction workers would be located closer to the noise sources, would experience longer exposure durations than the public, and would follow standard industry and OSHA procedures for hearing protection.

4.9.3 Crossover Corridor

Construction Impacts. The acoustical environment would be impacted during construction of the Crossover Corridor similarly to the Western Corridor as described in Section 4.9.1. While relatively high peak noise levels in the range of 80 to 103 dBA would occur on the active construction sites, these noise levels would be temporary and intermittent.

Table 4.9–1 presents the peak noise levels (dBA) expected for a single sound event from various equipment during construction. Table 4.9–2 presents the results of a sample calculation assuming a scenario of a bulldozer, jackhammer, and scraper operating simultaneously, which is highly unlikely.

The potential construction noise impacts of the Crossover Corridor would primarily affect the residences and commercial areas in the immediate vicinity of the ROW. The residences nearest to the ROW (the same as described for the Western Corridor) would experience construction noise levels that may be perceived as “striking” or very loud, comparable to a lawn mower or a leaf blower. These peak noise levels would be localized, temporary and intermittent. In addition to residences and businesses, intermittent peak noise levels would be experienced by nearby hikers and participants in other recreation along the Crossover Corridor in the Coronado National Forest, as described in Section 3.1.2.

A second measure of construction noise is the 24-hour average noise level, represented by the DNL to gauge average community noise effects. The DNL would decrease to near the background noise level of 48 dBA for receptors beyond 325 ft (99 m) from the ROW. As described for the Western Corridor in Section 4.9.1, the intermittent peak construction noise levels would not create the steady noise level conditions for an extended duration that could lead to Temporary Threshold Shift or Noise-induced Permanent Threshold Shift hearing damage (Canter 1977).

Operational Impacts. Upon completion of construction, the potential for noise impacts associated with the project would be from three major sources: (1) corona from the transmission lines (a crackling or hissing noise); (2) operation of the transformers at the substations; and (3) maintenance work and vehicles. As with the Western Corridor the potential corona effects and substation operational noise would be comparable to background noise levels for receptors, and thus not significant. Noise impacts from maintenance activities would be intermittent and not expected to be significant.

Based upon the noise impacts analyses of the Crossover Corridor, the primary effect of noise generated would probably be annoyance to the residents nearest to the ROW during the construction period. Construction workers would be located closer to the noise sources, would experience longer exposure durations than the public, and would follow standard industry and OSHA procedures for hearing protection.

4.9.4 No Action Alternative

Under the No Action Alternative, TEP would not build the proposed transmission line and the associated facilities as proposed in this EIS. Potential noise impacts associated with the construction and operation of the Sahuarita-Nogales Transmission Line Project would not occur. The local noise conditions would continue according to current patterns, as described in Section 3.9.